

WE CLAIM:

1 1. A glass article which includes a glass substrate
2 having thereon a sputter-coated layer system comprising
3 from the glass substrate outward, (a) a substantially
4 metallic layer which includes nickel or a nickel alloy; and
5 (b) an overcoat layer of silicon nitride (Si_3N_4); and
6 wherein the layers are each of sufficient thickness such
7 that when the glass substrate has a thickness of about
8 1.5 mm-13 mm and has the aforesaid layer system thereon the
9 so-layered glass article is heat treatable, and has a
10 visible transmittance of about 1-80% and a normal
11 emissivity (E_n) of about 0.10-0.60.

1 2. A glass article according to claim 1 wherein said
2 layer system does not contain any layer of silver; wherein
3 layer (a) is substantially free of any nitride; and wherein
4 said so-layered glass article is durable and chemically
5 resistant.

1 3. A glass article according to claim 2 wherein said
2 layer system includes an undercoat layer of silicon nitride
3 (Si_3N_4) located between said substantially metallic layer
4 and said glass substrate.

1 4. A glass article according to claim 2 wherein said
2 substantially metallic layer includes a minor amount of a
3 metallic oxide of the metal in said metallic layer.

1 5. A glass article according to claim 4 wherein said
2 layer system includes an undercoat layer of silicon nitride
3 (Si_3N_4) located between said substantially metallic layer
4 and said glass substrate.

1 6. A glass article according to claim 5 wherein said
2 layer system further includes a substantially
3 stoichiometric metallic oxide layer overcoating, said
4 substantially metallic layer and another substantially
5 stoichiometric metallic oxide layer undercoating said
6 substantially metallic layer.

1 7. A glass article according to claim 6 wherein said
2 undercoat and overcoat layers of substantially
3 stoichiometric metallic oxide are each contiguous with said
4 substantially metallic layer.

1 8. A glass article according to claim 1 wherein said
2 layer system comprises a plurality of alternating said
3 substantially metallic layers and said silicon nitride
4 (Si_3N_4) layer is an undercoat layer located between said
5 glass substrate and the first of said plurality of
6 substantially metallic layers.

1 9. A glass article according to claim 8 wherein said
2 layer system does not contain any layer of silver; wherein

3 layer (a) is substantially free of any nitride; and wherein
4 said so-layered glass article is durable and chemically
5 resistant.

1 10. A glass article according to claim 9 wherein at
2 least one of said substantially metallic layers includes a
3 minor amount of a metallic oxide of the metal in said
4 metallic layer.

1 11. A glass article according to claim 8 wherein the
2 metal in each of said substantially metallic layers is the
3 same nickel alloy and wherein said silicon nitride layers
4 include a minor amount of a conductive metal.

1 12. A glass article which includes a glass substrate
2 having thereon a sputter-coated layer system comprising
3 from the glass substrate outward, (a) a layer comprised of
4 a mixture of silicon nitride (Si_3N_4) and nickel or a nickel
5 alloy; and (b) an overcoat layer consisting essentially of
6 silicon nitride (Si_3N_4) and wherein the layers are each of
7 sufficient thickness such that when the glass substrate has
8 a thickness of about 1.5 mm-13 mm and has the aforesaid
9 layer system thereon the so-layered glass article is heat
10 treatable, durable, chemically resistant, and has a visible
11 transmittance of about 1-80% and a normal emissivity (E_n) of
12 about 0.10-0.60.

1 13. A glass article according to claim 12 wherein
2 said layer system further includes an undercoat layer
3 consisting essentially of silicon nitride (Si_3N_4) located
4 between the glass substrate and said layer (a) and wherein
5 said silicon nitride layers include a minor amount of a
6 conductive metal selected from the group consisting of
7 titanium, zirconium, chromium, hafnium, and mixtures
8 thereof.

1 14. A method of heat treating a coated glass article
2 comprising the steps of:

3 (a) sputter-coating onto a glass substrate a
4 layer system comprising from the glass substrate outwardly,
5 a substantially metallic layer which includes nickel or a
6 nickel alloy; and an overcoat layer of silicon nitride; and
7 (b) thereafter subjecting this coated glass
8 substrate to a heat treatment selected from the group
9 consisting of bending, tempering, heat strengthening and
10 combinations thereof; and

11 (c) wherein after this heat treatment the
12 resultant article has a normal emissivity (E_n) of about
13 0.10-0.60 and a visible transmittance of about 1-80%, and
14 wherein said visible and solar transmittance are changed
15 less than about 20% by said heat treatment.

1 15. The method according to claim 14 wherein said
2 visible and solar transmittance was changed less than about

3 10% by said heat treatment; wherein said layer (a) is
4 substantially free of any nitride; and wherein said coated
5 glass article both before and after said heat treatment is
6 durable and chemically resistant.

1 16. The method according to claim 15 wherein said
2 visible and solar transmittance was changed less than about
3 2% by said heat treatment.

1 17. The method according to claim 14 wherein said
2 sheet resistance (R_s) was not increased more than about 10%
3 by said heat treatment.

1 18. The method according to claim 17 wherein said
2 sheet resistance (R_s) was not increased by said heat
3 treatment.

1 19. The method according to claim 18 wherein said
2 sheet resistance (R_s) was decreased by said heat treatment.

1 20. The method according to claim 14 wherein said
2 layer system does not contain any layer of silver, wherein
3 said layer (a) is substantially free of any nitride; and
4 wherein said coated glass article both before and after
5 said heat treatment is durable and chemically resistant.

1 21. The method according to claim 20 wherein said
2 steps further include sputter coating onto said substrate
3 an undercoat layer of silicon nitride (Si_3N_4) located
4 between said substantially metallic layer and said glass
5 substrate.

1 22. The method according to claim 20 wherein said
2 substantially metallic layer includes a minor amount of a
3 metallic oxide of the metal in said metallic layer.

1 23. The method according to claim 22 wherein said
2 steps further include sputter coating onto said substrate
3 an undercoat layer of silicon nitride located between said
4 substantially metallic layer and said glass substrate.

1 24. The method according to claim 23 wherein said
2 steps further include sputtering a substantially
3 stoichiometric metallic oxide layer overcoat above said
4 substantially metallic layer and sputter coating another
5 substantially stoichiometric metallic oxide layer undercoat
6 beneath said substantially metallic layer.

1 25. The method according to claim 24 wherein said
2 sputter coating of said undercoat and overcoat layers of
3 substantially stoichiometric metallic oxide occurs
4 immediately before and immediately after, respectively,
5 said sputter coating of said substantially metallic layer
6 so as to be contiguous therewith.

1 26. The method according to claim 14 wherein said
2 heat treatment is conducted at a temperature from about
3 1150°F - 1450°F.

1 27. The method according to claim 14 wherein said
2 silicon nitride layer includes a minor amount of a
3 conductive metal.

1 28. A method of heat treating a coated glass article
2 comprising the steps of:

3 (a) sputter coating onto a glass substrate a
4 layer system comprising from the glass substrate outwardly,
5 a layer comprised of a mixture of silicon nitride (Si_3N_4)
6 and nickel or a nickel alloy and thereafter an overcoat
7 layer consisting essentially of silicon nitride; and

8 (b) thereafter subjecting the coated glass
9 substrate to a heat treatment selected from the group
10 consisting of bending, tempering, heat strengthening and
11 combinations thereof; and

12 (c) wherein after this heat treatment the
13 resultant article has a normal emissivity (E_n) of about
14 0.10-0.60 and a visible transmittance of about 1-80%, and
15 wherein said visible and solar transmittance are changed
16 less than about 20% by said heat treatment.

1 29. A method according to claim 28 which includes the
2 further step of sputter coating an undercoat layer of
3 silicon nitride (Si_3N_4) so as to be located between said
4 glass substrate and said layer of a mixture of silicon
5 nitride (Si_3N_4) and nickel or nickel alloy.

1 30. A method according to claim 29 wherein said
2 silicon nitride includes a minor amount of a conductive
3 metal.

1 31. A method according to claim 28 wherein said heat
2 treatment is conducted at about 1150°F - 1450°F.